

Top-5 Concerns of County's Proposed Hydraulic Modeling Rules - Compendium Gathered from National Hydraulic Modeling Experts. February 16, 2016

For the source document that is the subject of the public hearing, please see:

http://www.hamiltoncountyohio.gov/hc/hc_pdfs/01.07.16_Draft%20MSDGC%20Rule%20Adopting%20Modeling%20Standards.pdf

These comments are technical in nature. They represent important principles of wastewater collection system modeling that should be considered as part of a public hearing process. Professionals within the field of practice rely on best practice in the field of urban drainage in which to make decisions. An internationally recognized industry organization called Wastewater Planning Users Group (WaPUG) is referenced and used to determine applicability of best professional/industry guidelines. Upon review of the proposed Hamilton County monitor recommendations for Hydraulic Modeling Rules – below is a compendium of concerns related to the proposed rules as identified by national modeling experts. **There is great concern that by instituting these rules, projects will take more time and money to implement.**

1. **Flow Monitoring:** Hamilton County is recommending rigid compliance with the Wastewater Planning Users Group (WaPUG) standards yet suggesting non-WaPUG requirements. For example Step 5 in Table 1 of the County proposed requires matching 2/3rd monitored and modeled events which are not a WaPUG recommendation. MSD's current practice to select 3-5 events is reasonable. Based on best professional opinion, it is impossible to capture the range of events suggested by the County proposal (in Table 1, Footnote 1) because by definition some are very infrequent and it's impracticable to capture data for these. Furthermore, obtaining flow monitoring data for large intense storms can be difficult since the meters often don't capture the flow during the peaks of the event.

The WaPUG standards inherently assume perfect flow monitoring data, and call for imperfect data to be discarded. In practice, flow monitoring data fall into groups ranging from “free from apparent defects” to “flawed but still useful with caution” to “only useful for specific purposes” to “not useable”. This reality is not recognized in the WaPUG standards, which also cannot account for the advances in flow monitoring technology over the past 13 years. Finally, the quality of flow monitoring data can be suspect – it's not wise to chase to calibrate models to less than perfect flow data. Requiring CSO outfall volume monitoring (in Table 1, Step 6 and Footnote 3) is another example of a non-WaPUG requirement. CSO/SSO monitoring data has traditionally been very difficult to accurately collect. The currently available flow monitoring technology has serious limitations when measuring overflow volume. Because the overflow pipe is normally dry, this creates a condition that prevents proper on-site calibration of the monitoring equipment. This often results in significant inaccuracy when measuring velocity, and therefore, flow volume at outfall pipes. Hence, direct measurements of overflow volume should generally not be used to calibrate or validate the model; instead overflow activation frequency (rather than volume) should often be the selected metric. Flows and levels in overflows should be used as qualitative measures rather than quantitative (CDM, CH2M, Jacobs, Stantec, XCG, Arcadis, 2016).

2. **Continuous Calibration:** On Page 5, Hamilton County requires “When continuous calibration is used, the modeled results must at a minimum match 2/3rds of the storm events in the continuous series for all three parameters (Peak Flow, Volume and Depth) within the limits established by the WaPUG standards.”

This is an unreasonable and non-WaPUG requirement because as noted above, operational variability, inconsistencies between flow monitors, etc. can render the model calibration/validation process unable to satisfy this requirement for at least some locations. It is important to avoid forcing

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the model to match wrong events on the expense of matching the good observed events. A model should be representative of the conditions in the system and the conditions that represent the level of service that MSDGC is aiming to obtain. A goodness of fit statistical criteria is more suitable for continuous calibration which has not been mentioned by the county (CDM, Jacobs, CH2M, XCG, Arcadis, 2016).

- 3. Flooding:** In Table 1, Step 7, the proposed County rules requires “Flooding during calibration / validation storms should be reproduced by the model.” This is an unreasonable and Non-WaPUG requirement because storms that result in street flooding should generally not be selected to support model calibration under standard industry practice in North America. However, such events can be used for model validation. MSD’s system wide model (SWM) is a “Typical Year” model and should be calibrated and validated to normal rather than extreme events suggested by the County. Capturing historic flooding locations in terms of severity and frequency is potentially a major undertaking. Accurately representing storm events for which appropriate data has not been collected (i.e. 10-year storms or 100-year flooding events) with the model may not be a desirable or suitable use. We should also have in mind the usage of the model - uses for peak flow flood management issues are different from wet weather management where volume is important. Finally, flooding can be caused by a pipe blockage or other obstruction; this would not be reflected in any model (CDM, CH2M, Stantec, Jacobs, XCG, 2016).
- 4. Using Aquifer Model for RDII:** On Page 6, the proposed County rule is requiring use of an aquifer model to model RDII. This is an unreasonable and Non-WaPUG requirement because this process has been evaluated for only one meter for the upper Duck Basin and is being pilot tested on one metershed for the SSO 700. This calibration process takes more time and effort. Most importantly, sufficient results are not available at this time to demonstrate the cost-benefit of the aquifer approach as proposed in the County draft rules. Requiring a specific RDII calculation method is not a good idea (CH2M, Jacobs, Arcadis, 2016).
- 5. Rigid Standards:** The proposed rule is requiring the “must do” language throughout the document which is too strong and counterproductive for applying engineering judgment encouraged by WaPUG on a case-by-case basis. Requiring a model to absolutely meet rigid calibration criteria will necessitate increased flow monitoring data, increased analysis and review. However, taking these steps still does not guarantee a calibrated model per the proposed requirements. WaPUG is not a regulatory body and has no authority on practices in Hamilton County. WaPUG should be viewed as an information source rather than the limiting authority. Treating WaPUG as baseline standard over knowledge and experiences of MSDGC staff and consultant community is, therefore, not a good idea. Converting the proposed recommendations into a formalized rule without giving MSDGC staff and their modeling professionals the flexibility to utilize best professional judgment will likely not reduce a projects overall risks or costs, but rather, will likely increase the cost of planning and design.

The Model is a live tool at which spending annual budget to perform model updates is a common engineering standard practice. MSDGC has shown due diligence to ensure the model is advancing as the modeling practice advances to ensure the model evolves into a more precise planning tool. The fact MSDGC continuously updates its Modeling Guidelines and enforces reevaluation of WWIP components before design is evidence of MSDGC care for the taxpayer money.

There is an “art” to modelling and strict standards won’t work. A formalized set of rules may require a rejected model to go through the process all over again with additional flow monitoring and calibration. Extending this process will lead to project delays and the potential risk of missing regulatory deadlines and incurring stipulated penalties. Overall, the WaPUG work is a guidance

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document, not an absolute set of rules that apply in all situations. The proposed rule implies that the new standard would not allow for much in the way of flexibility or professional judgment. Finally, the quality of wastewater infrastructure is generally not directly impacted by the modeling tools. Industry standard is to use design calculations and local standards to determine the capacity and sizing of new wastewater and/or storm water infrastructure (CDM, CH2M, Jacobs, Stantec, XCG, Arcadis, 2016).